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VALLEY DEPENDENCIES OF THE SCIOTO ILLINOIAN LOBE IN LICKING COUNTY, OHIO

FRANK CARNEY

Leverett classifies the drift of eastern Licking County as Illinoian. He says: The Illinoian deposits are much heavier in valleys than on uplands, and there is a marked sinuosity of margin to conform to the topographic conditions.¹ The observations described in this paper were undertaken in part to give closer definition to the extent of the topographic control to which Leverett refers. The paper attempts to show that the Scioto lobe on this part of its eastern margin, where it reached out over the more rugged topography of the coarser Mississippian and Pennsylvanian formations, was affected by valley dependencies. It is felt that a detailed study of the marginal areas may add to our knowledge of the exact shape of the ice-front at the time of its maximum extension.

MARGIN OF THE ILLINOIAN DRIFT

In central Ohio.—The general lobation of the Illinoian sheet, according to Leverett,² reflects the influence of great basins in the topography farther north, the Huron-Erie basin probably controlling its extension into the tract now drained by the Scioto River. That the extreme reach of the Illinoian ice in the southern part of the state—i. e., where it crosses the Ohio River in Brown County—is due to a combination of controls, seems likely.

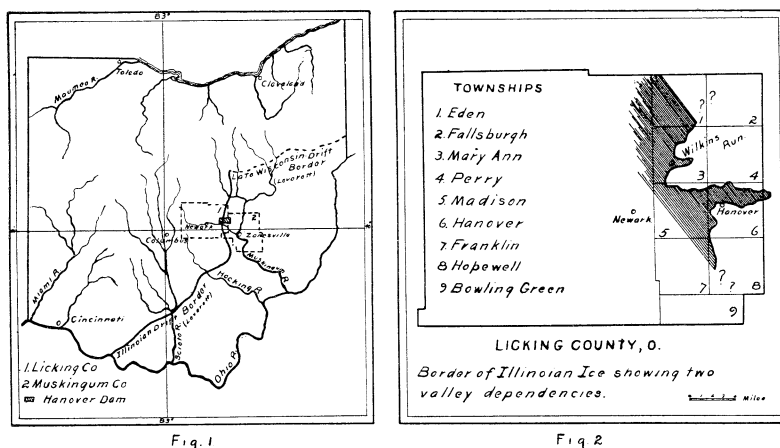
Fig. 1 gives the results of Leverett's mapping of the Illinoian ice in Ohio. It appears that in one general locality on the eastern side of the Scioto lowland the ice manifested a tendency to protrude, as is shown by the curve southwest of Muskingum County; another evidence of this impulse is seen (Fig. 2), just north of this convexity, in the valley dependencies reaching beyond the body of the ice-field,

¹ *Glacial Formations of the Erie and Ohio Basins*, XLI Monograph, U. S. Geological Survey (1902), p. 222.

² *Ibid.*, p. 226.

described in the present paper. This later and more leisurely field-study gives greater prominence and exactness to this curve of local lobation first examined by Leverett.

In Licking County.—Save in the valleys, the Illinoian drift near its front is so attenuated that mapping it is a problem of elimination, or the careful study of the rather maturely dissected divide areas. The lesser details of topography in the marginal zone appear to have had slight influence on the outline of the ice-front, while obviously exercising a considerable control over the duration of the ice in its position



of maximum reach. This latter fact necessitates patient observation, particularly where the stratigraphy did not encourage differential-weathering effects previous to glaciation; it is evident that on slopes of heterogeneous rock structure facing the direction of ice-movement, benches of the more resistant formations, weathered into semi-detached spires and blocks,¹ would have suffered some from ice-work, even though the products of residual decay did not receive a noticeable admixture of glacial drift. But among the hills, where the rock structure is more uniform, and the weathered slopes correspondingly even, the absence of foreign material must be established before drawing the drift-line; and in these higher areas an unexpected localization of erratics surrounded completely by territory in which

¹ F. Carney, *Bulletins of Denison University*, Vol. XIII (1906), p. 124.

the most diligent search has not revealed any evidence of glaciation is somewhat puzzling, but very convincing of the fact that the final demarkation of the glacial boundary is a problem of time.

In establishing the relationship of these valley dependencies of the Illinoian ice-sheet to the Scioto lobe, and in determining whether they are tongue-like extensions of the ice-mass at its period of greatest development, or at a later retreatal stage, three townships, Perry, Hanover, and Mary Ann, of Licking County, have been carefully

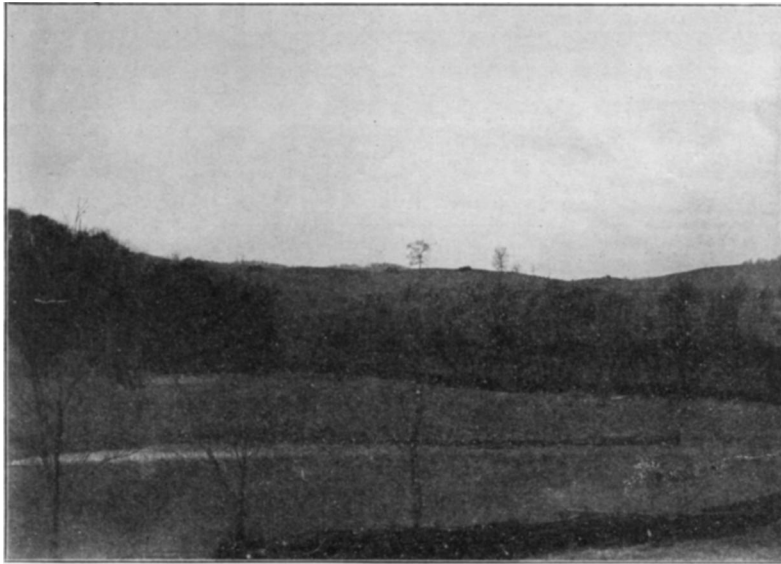


FIG. 4.—Looking south of east. The wooded area on the extreme left is rock, as is also the slope above the buildings on the right. The intervening ridge of drift marks the position of the ice-tongue that extended eastward from Wilkins Run.

studied, while like attention has been given to portions of adjacent townships. In valleys trending in general with the direction of ice-movement, the problem is one of distinguishing the unmodified drift from the deposits of entirely extra-glacial waters, and of determining the drift-covered portion of the valley walls.

It has been established that ice did not enter Perry township (Fig. 2) from the north or west,¹ and that the township was not glaciated

¹ F. Carney, *loc. cit.*, p. 124.

save for the presence of a lateral tongue reaching northward from the valley lobe that extended eastward into Muskingum County (Fig. 3).¹ Less than one-half of the next township west, Mary Ann, was covered by ice; this ice had a very irregular front. The conspicuous drift knolls at Wilkins Run are alluded to by Wright,² and by Leverett.³ One of the most typical valley trains of this region was built into the mature valley southwest of Wilkins Run.

The southeast corner of Eden Township was not glaciated; but the front of the ice has not been traced in detail through this township, nor into Fallsburg. A small portion of the northeast corner of Madison Township was not covered by ice. The outline of the drift in Hanover Township is considered in the following section. Southward into Hopewell Township the margin of the ice has been traced in detail for only a short distance.

VALLEY DEPENDENCIES

At Wilkins Run.—A tongue of ice about one and seven-tenths miles long reached eastward from Wilkins Run. This village lies at one side of a mature valley which once embraced in its drainage the area east and north, the region now constituting the headwaters of the Rocky Fork; this defunct valley opened westward into the valley of the North Fork of the Licking River, and belonged to the ancient Newark River.⁴

¹ Since the government has not issued a map of this area, the writer, appreciating the difficulty that one not acquainted with the region would have in visualizing the topography described in the paper, has attempted to represent in contours the relief of the section about Hanover. No traverse work was done; county surveyor's maps were used for the highways and horizontal distances, an attempt being made to correct the grosser errors. It is felt, however, that the altitudes in reference to the arbitrary bench mark selected have been established with greater accuracy. For this purpose two aneroids were used; these instruments are of the same make, and for over a year have shown the same variation when together. During the progress of the field-work the aneroids were set the same at the bench each morning; the one kept at the bench was read every thirty minutes. The time at which readings were made on the other instrument in the field was recorded; the watchers were also set alike each morning. At night the field readings were corrected for the variations shown by the bench aneroid. Many critical points were checked several times.

² *The Glacial Boundary in Ohio*, Geological Survey of Ohio, Vol. V (1884), p. 755.

³ *Loc. cit.*, p. 260.

⁴ W. G. Tight, *Professional Paper No. 13*, U. S. Geological Survey (1903), p. 18.

This tongue-like extension of the ice pushed eastward to the point where the valley turns to the north; a tributary from the east which joins the major at its bend to the north, being in line with the feeding ice, was blocked also. The ice reached northward but a short distance beyond this angle; a few drift knolls mark this brief position. A halt of considerable duration was made after the ice had retreated to a position bringing the north side of the valley tongue directly across the valley; here it built a marginal ridge averaging 90 to 95

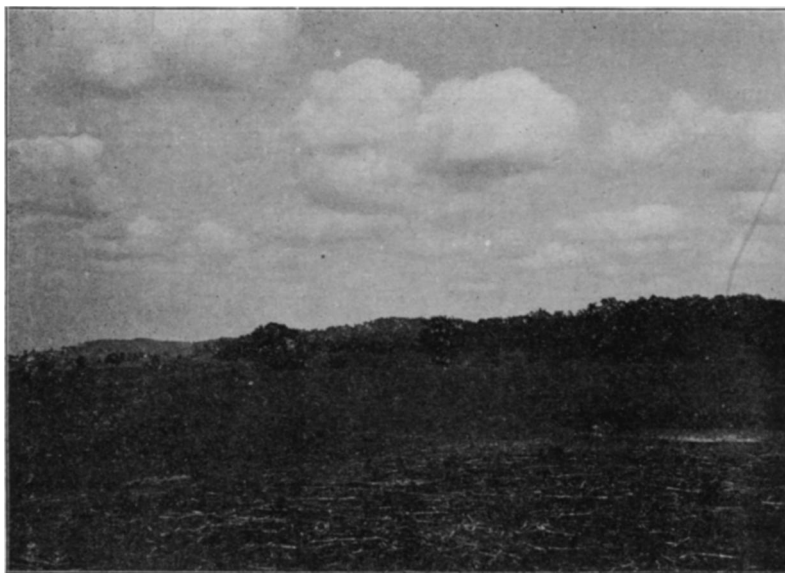


FIG. 5.—Moraine which marks the terminus of the Hanover valley dependency.

feet high, at no point lower than 70 feet, and about 500 feet broad at the base (Fig. 4). A terrace of similar development marks the outline of the ice against the walls of the valley elsewhere, except in front of the tributary valley, mentioned above, through which most of the drainage from the ice was led east to the Rocky Fork valley. It is evident that the Rocky Fork drainage had gained control of the mature valley long previous to its being occupied by this ice.

These moraine terraces, best developed on the south side of the valley, are very conspicuous. Commencing across the valley from

the hills mentioned by Wright,¹ a terrace of the aggradation type reaches half-way up the valley wall; it gradually descends eastward, where it becomes more irregular both because of initial distribution and of subsequent weathering. The line of demarkation between this drift and the upward slope is sharp.

The main body of ice, while the tongue reached eastward, maintained a position nearly north-south for a few miles each way from Wilkins Run. North of this place, so far as Mary Ann Township is concerned, the retreat of the ice-front appears to have been rapid, and there is no evidence that the valley lobe maintained intermediate positions; but the old valley becoming broader southwest of Wilkins Run encouraged a tongue-like extension of ice at the next halt of the ice-field; the well-developed valley train already mentioned was formed at this time.

At Hanover.—Here we have a much wider valley than the case just cited. The tongue of the ice reached about six miles eastward from the main body of ice. The maximum position of this valley dependency is marked by typical morainic topography (Fig. 5), with a contemporaneous deposition of drift against the side walls of the valley, which above the glacial débris are veneered with rock decay *in situ*. The line of demarkation between this drift and the valley wall is shown very conspicuously on the Hagerty farm southeast of the 216-foot well (Fig. 3). The drift, judged from surface appearance, especially east of the Muskingum County line, is rather bouldry; no very large bowlders were noted, but their fewness may be accounted for by the fact that the area has long been under cultivation.

This tongue-like extension of the ice maintained its distal position for some time, but in comparison with the duration of retreatal positions the period was proportionately brief. At the second halt the alignment of the drift suggests a tapering of the ice-tongue; this form, however, is not seen in the other halts (Fig. 3, *H.* 3, 4, etc.), because of the contraction that exists in the valley in the vicinity of Hanover. So long as the ice fed actively through this narrow part it broadened some in the wider segment of the valley beyond; only in this latter area should we expect to find evidence of tapering as the ice-movement weakened.

¹ *Loc. cit.*, p. 755.

Moreover, it should be noted that the distribution of the drift in this valley does not conform to the pattern usually normal to valleys¹ which encourage tongue-like extensions from the ice border in line with the direction of the deploying ice. The east-west valley passing Hanover is unusual in that it has a composite history, the most obvious feature of which, that it was formerly the course of a west-flowing stream, has been published.² The continuity of the south wall of the valley is broken by gaps at *A*, *B*, and *C* (Fig. 3), representing a change in the drainage-control of the region; the presence of these openings allowed free drainage, particularly in the case of *A* and *C*, from the southern side of the ice-tongue, thus removing much glacial rubbish that otherwise would have remained as a lateral terrace or ridge.

Furthermore, westward from Hanover the valley grows broader; at Newark, a distance of seven miles, it is about two miles between the rock walls. Consequently as the margin of the eastern side of the Scioto lobe assumed new positions in its decline—a long halt has been noted in the vicinity of Newark³—this valley dependency persisted.

The details of the drift south and southwest of Claylick have been studied for two miles, showing that the retreat of the main body of the ice was gradual, and apparently maintaining positions parallel to the convex margin mapped by Leverett.

SUMMARY

A study of the Illinoian drift in this broken topography of the coarser-textured and more resistant formations of the Mississippian and Pennsylvanian periods establishes the existence of tongue-like dependencies of the Scioto lobe reaching out into the eastward-trending valleys.

¹ R. S. Tarr, *Bulletins of the Geological Society of America*, Vol. XVI (1905), pp. 218, 219.

² F. Leverett, *loc. cit.*, p. 155; W. G. Tight, *Bulletins of Denison University*, Vol. VIII (1994), p. 47.

³ F. Leverett, *loc. cit.*, Plate II.